Remarks

The specification is objected to because of informalities. The specification is amended to correct these informalities. No new subject matter is added.

Claims 1-5 are pending in the application. Claims 1-5 are rejected. All rejections are respectfully traversed.

Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chow et al. (U.S. Patent 5,285,474) in further view of Kim (U.S. Patent 5,502,507).

The Examiner states that:

Claim 1, Chow discloses repeatedly sending a training sequence through the channel to the receiver, using the equalizer parameters, the received sequence, and a local replica of the training sequence to update a set of channel target response parameters, windowing the channel target response parameters, using the channel target response parameters, the received sequence and the local replica to update the equalizer parameters, and windowing the equalizer parameters. This training process is repeated until a predetermined convergence condition is detected (col. 5, line 60 – col. 6 lines 2). Chow further discloses the equalizer update method includes the use of a circular buffer for updating equalizer taps (col. 8, lines 51-66). Chow further discloses that generally this loop is repeated either until the error falls below a predetermined threshold (col. 7, lines 51-55). Chow fails to use mean square error estimation in his invention.

Unfortunately, none of the Chow limitations are claimed by the present invention. Chow repeatedly sends the training signal. This consumes transmitter, channel and receiver resources. This is also disadvantageous for long training signals.

In contrast, the claimed stores "**a training signal** received via the channel in a circular buffer as a circulating training signal." Note, the singular form "a training signal." It would be understood by those of ordinary skill in the art that what is claimed is a single training signal is received. Chow repeatedly sends his training signal.

As an advantage, the invention improves the overall performance of adaptive equalizers at a reduced complexity and slow convergence rates, particularly when a short sequence of symbols is used in the training signal because the training signal is circulated. Thus, the invention can be used with equalizers with slow convergent rates, and can also be effectively used with other types of equalizers with short training signal symbol sequences, see page 3, line 14 et seq.

Chow does not store a training signal in a circular buffer as a circulating training signal. The only reference to anything circular in Chow is at column 8.

> **B block 1400 of FIG. 6. The updated channel target is passed through an IFFT block 1410, producing $b_u(D)$. The Locate Maximum Energy block 1420, by treating $b_u(D)$ as a circular buffer, computes the total energy of each group of L consecutive taps (where L, the window size, is predetermined and fixed), and the group of L taps with the maximum energy is found. The window-**

There is no circular buffer. Chow states that a signal $b_u(D)$ is treated as a circular buffer. The signal $d_u(D)$ is derived from parameters of a time-domain channel target response. Those of ordinary skill in the art would never confuse a circulating training signal as claimed with the Chow parameters of a time-domain channel target response.

Chow does not store a training in a circular buffer.
Chow does not minimize a mean square error of the training signal.
Chow does not compare the mean square error with a threshold.
Chow does not equalize an input signal if the mean square error is less than the threshold.

Thus, Chow doe not teach, suggest or describe any of the claimed limitations.

Kim does not cure the defects of Chow.

Kim does not store a training in a circular buffer.
Kim does not minimize a mean square error of the training signal.
Kim does not compare the mean square error with a threshold.
Kim does not equalize an input signal if the mean square error is less than the threshold.

Thus, Kim in combination cannot make the invention obvious.

Applicant admits that how to compute a mean square error (MSE) is known generally. However, the use of the MSE in Kim bears no relation to what is claimed or what is described by Kim. Therefore, combining Kim and Chow makes no sense. Kim applies the MSE to an already equalized (filtered) television signal. What is claimed is minimizing a MSE of a training signal, while estimating the training signal. Kim is silent on

a) a training signal
b) training signals stored in a circular buffer
c) minimizing a mean squared error.

Kim merely "evaluate[s] a mean square error (MSE) thereof," see column 4, lines 21 et seq.

At the time the invention was made, it would not at all be obvious to use a short training signal. In fact, prior art short training signals are clearly disadvantageous. As is well known, up to now, long training signals are preferred. Long training signals have a much lower mean square error, while short training signals have a greater mean square error. Therefore, one would be included to use longer training signals.

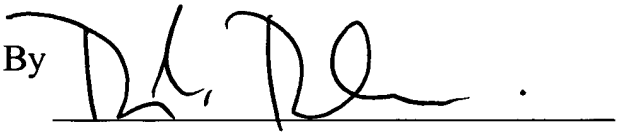
However, the novel short training signal, when circulated in the manner as claimed, looks and behaves as a long signal to realize a mean square error that is comparable to a MSE of a long training sequence, without the extra overhead of the long training signal. Thus, more bandwidth is available for data signals without degrading performance. In the past, short signal have only been possible with LMS type equalizers, see page 5, line 3. The invention enables the novel circulated short training signals for MSE type equalizers.

As stated above Kim is inapplicable to both what is claimed and Chow.

Neither Chow nor Kim discloses any of the elements of claim 4 and 5. There are in circular buffers in Kim and Chow that store circulating training signals. And, certainly, neither Kim nor Chow minimizes a mean square error of a circulating training signal.

It is believed that this application is now in condition for allowance. A notice to this effect is respectfully requested. Should further questions arise concerning this application, the Examiner is invited to call Applicant's attorney at the number listed below. Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 50-0749.

Respectfully submitted,
Mitsubishi Electric Research Laboratories, Inc.

By 

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